Geometry Notes

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MATH

Line segments, slope and midpoint

In this lesson we'll look at how to find the slope and midpoint of line segments.

Slope

The slope of a line helps to show how steep a line is and if it's going "uphill" (a positive slope) or "downhill" (a negative slope) from left to right. You can find the slope of a line if you have two points that lie on the line.

Let's say you have points (x_1, y_1) and (x_2, y_2) that represent the coordinates of the first and second point. Then the formula for the slope, m, is

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Let's start by working through an example.

Example

What is the slope of the line segment between the points $(4, -5)$ and $(-3,6)$?

We'll plug these points into the formula for the slope of a line.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - (-5)}{-3 - 4} = \frac{6 + 5}{-3 - 4} = \frac{11}{-7} = -\frac{11}{7}$$

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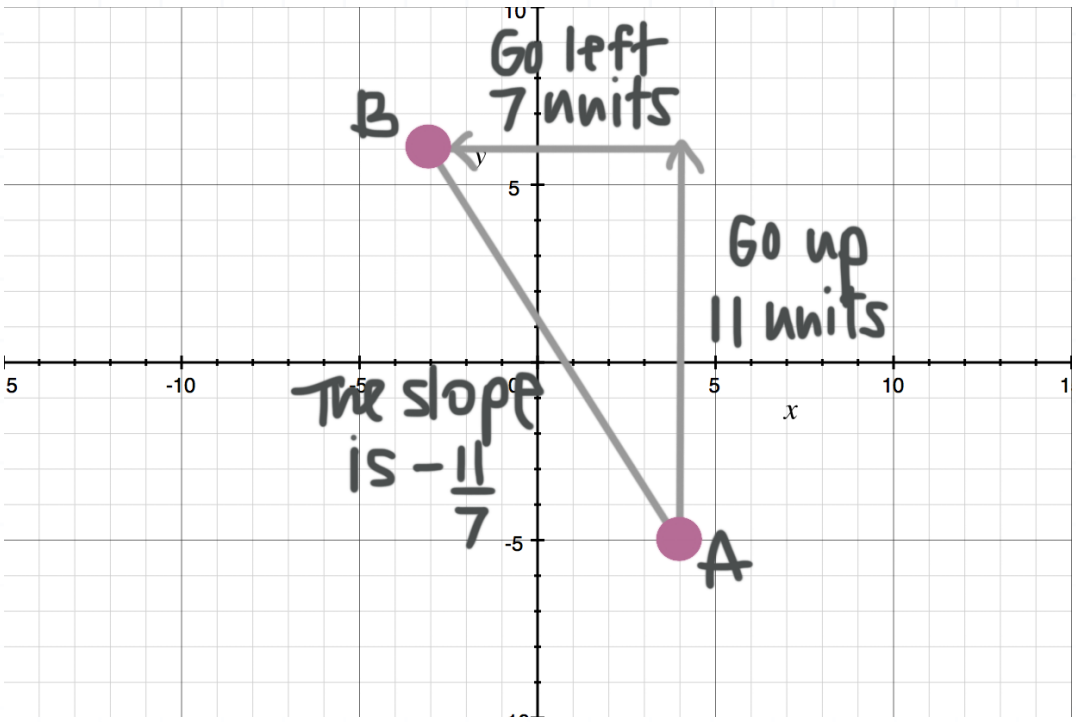
It doesn't matter which point we use first. If we switch the points, we get the same slope:

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5-6}{4--3} = \frac{-5-6}{4+3} = \frac{-11}{7} = -\frac{11}{7}$$

You can also find the slope by plotting the points:



Midpoint

The midpoint between two points is the point that's in between both points and divides the line segment that connects the two points into two equal parts.

The formula for the midpoint, M, given points (x_1, y_1) and (x_2, y_2) is

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$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Let's look at an example.

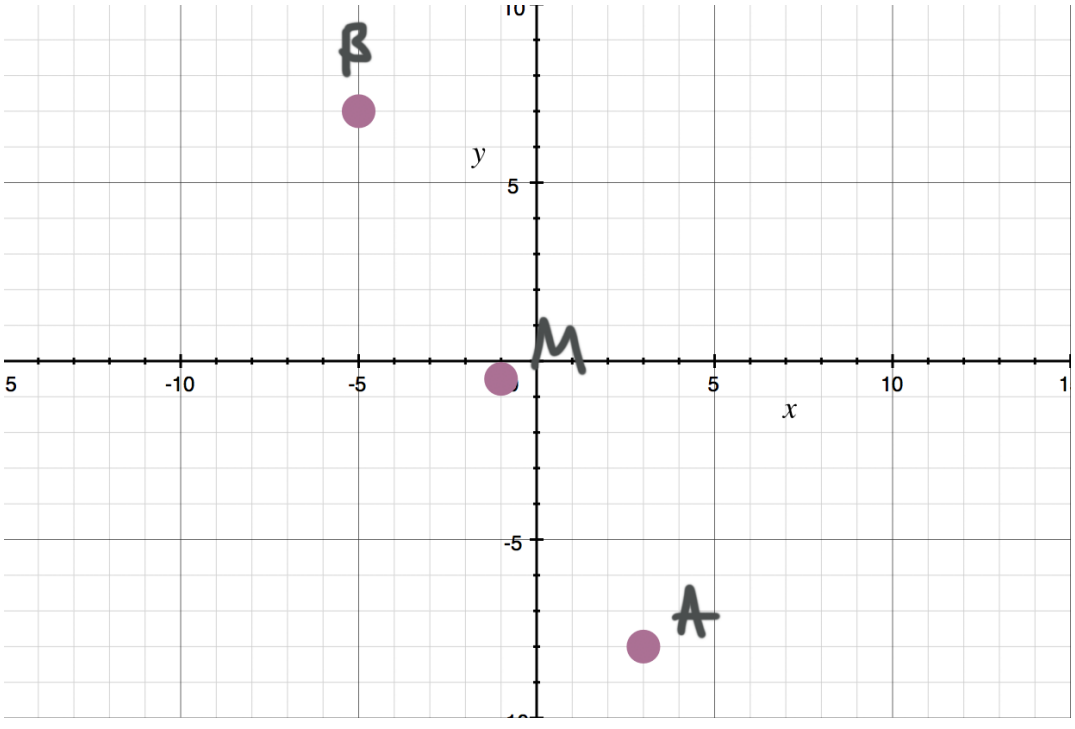
Example

What is the midpoint of the line segment between the points $(3, -8)$ and $(-5,7)$?

Plug the points into the formula for the midpoint.

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \left(\frac{3 + (-5)}{2}, \frac{-8 + 7}{2} \right) = \left(\frac{-2}{2}, \frac{-1}{2} \right) = \left(-1, -\frac{1}{2} \right)$$

Graphically it looks like this:



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